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EXAMINER	
ZIMMERMAN, JOSHUA D	
ART UNIT	PAPER NUMBER
2854	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/521,856	BLEES, MARTIN HILLEBRAND	
	Examiner	Art Unit	
	JOSHUA D. ZIMMERMAN	2854	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-7 and 10-12* is/are pending in the application.

4a) Of the above claim(s) *11 and 12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-7 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

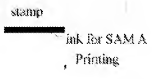
The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1, 2 and 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delamarche et al. (J. Am. Chem. Soc. 2002, 124, 3834-3835) in view of Fleming et al. (US 6503564)

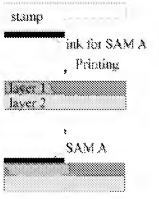
Regarding claim 1, Delamarche et al. teach "a method of applying a self-assembled monolayer of a molecular species to a surface of an article (Figure 1A), comprising:

providing on at least a portion of a stamping surface of a stamp a self-assembled monolayer-forming molecular species (see 'ink for SAM A' in reproduced section of figure 1A)



having a first functional group selected to attach to said surface, and a second functional group that is exposed when the species form a monolayer, said second group being polar (the species used by Delamarche et al. is an alkanethiol, the same as used by applicant. See second sentence of the second paragraph on page 3834),

transferring the molecular species from the stamping surface to a first portion of the article surface (see reproduced section of figure 1a below)."



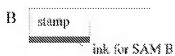
Delamarche et al. do not specifically teach "and allowing the molecular species to spread evenly from the first portion of the article surface to a second portion of the article surface, wherein the spreading is accomplished without immersion in a liquid incompatible with the molecular species." However, Delamarche et al. teach that when forming a self-assembled monolayer (SAM), the stamp is left in contact for an amount of time (first full paragraph of page 3835). One having ordinary skill in the art would recognize that the stamp is left in contact for an amount of time because the formation of SAMs is a kinetic process (that is, a process that is time-dependent), and therefore the stamp is left in contact with the article surface in order to allow the SAM to form on the article surface. One having ordinary skill in the art would also recognize that when a SAM-forming species is applied to a surface, due to surface tension effects and to gravity, the species will naturally spread on the surface (see, for example, figure 2 of Delamarche et al.). Therefore, the molecular species in the method taught by Delamarche et al. would "spread evenly from the first portion of the article surface to a

second portion of the article surface." Further, Delamarche et al. further teach that, while the stamp is in contact, it is not immersed in a liquid; rather, the structures are formed by first stamping, *then* immersing in a liquid (see Figure 3, and first full paragraph of page 3835). Therefore, the 'spreading,' as defined above, is accomplished when not immersed in a liquid.

Delamarche et al. are also silent in regards to the atmosphere of the stamping process. Since no special conditions are mentioned, a normal air atmosphere is implied. However, Fleming et al. teach a method of making a microstructured article wherein a reduced atmosphere is used in order to provide a clean environment. Therefore, at the time of the invention, it would have been obvious to one having ordinary skill in the art to modify the process of Delamarche et al. by placing the article "in reduced pressure atmosphere" in order to provide a clean environment to reduce contamination.

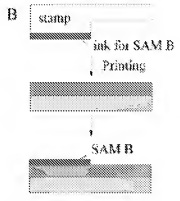
Regarding claim 2, Delamarche et al. teach "a method of applying self-assembled monolayers of two molecular species to a surface of an article (figure 1B), comprising:

providing on at least a portion of a stamping surface of a stamp a first self-assembled monolayer-forming molecular species (see 'ink for SAM B in reproduced figure below)



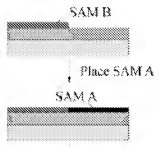
having a first functional group selected to attach to said surface, and a second functional group that is exposed when the species form a monolayer, said second group being polar (Delamarche et al. use the same species as applicant, PTMP),

transferring the molecular species from the stamping surface to a first portion of the article surface (see reproduced section of figure below),



providing … a second self-assembled monolayer-forming molecular species having a first functional group selected to attach to said surface, and a second functional group that is exposed when the species form a monolayer, said second group being polar or non-polar (Delamarche et al. use the same species as used by applicant, ECT),

transferring the molecular species … to said first portion of the article surface coated with a monolayer of said first molecular species (see reproduced section of Figure 1B below)."



Delamarche et al. fail to specifically teach that the second molecular species is applied via a stamping process. Delamarche et al. simply teach "plac[ing]" the second species (see the reproduced section of Figure 1B, above). Figure 2 of Delamarche et al. shows that the second SAM (ECT) does not significantly replace the first SAM (PTMP) on the surface; therefore, one having ordinary skill in the art would recognize that applying the second SAM-forming species on top of the first SAM-forming species by forcibly using a stamp would result in the second SAM-forming species spreading over the first SAM and then adhering to the surface of the article and forming a second SAM. One having ordinary skill in the art would also recognize that applying pressure while applying the second species would speed up the coating process. Further, since the first SAM-forming species is applied via a stamp in the process of Delamarche, one having ordinary skill in the art would have been motivated to apply the second SAM-forming species to the article via a stamping process in order to effectively apply and distribute the second SAM-forming species.

Also, Delamarche et al. do not specifically teach "and allowing the second molecular species to spread evenly over the first monolayer to a second portion of the article's surface." However, Delamarche et al. teach that when forming a self-assembled monolayer (SAM), the stamp is left in contact for an amount of time (first full

paragraph of page 3835). One having ordinary skill in the art would also recognize that formation of SAMs is a kinetic process (that is, a process that is time-dependent), and therefore would be motivated to leave the stamp in contact with the article surface in order to allow for distribution of the SAM-forming species and to allow for the molecules to self-assemble. One having ordinary skill in the art would also recognize that when a second SAM-forming species is applied to a first SAM, due to surface tension effects, gravity, and the pressure applied by the stamp, the species will naturally spread on the surface (see, for example, figure 2 of Delamarche et al.). Therefore, the molecular species in the method taught by Delamarche et al. would "spread evenly over the first monolayer to a second portion of the article's surface."

Delamarche et al. further teach that, while the stamp is in contact, it is not immersed in a liquid which is incompatible with the molecular species; rather, the structures are formed by first stamping, *then* immersing in a liquid (see Figure 3, and first full paragraph of page 3835). Therefore, the 'spreading,' as defined above, is accomplished when not immersed in a liquid.

Delamarche et al. are also silent in regards to the atmosphere of the stamping process. Since no special conditions are mentioned, a normal air atmosphere is implied. However, Fleming et al. teach a method of making a microstructured article wherein a reduced atmosphere is used in order to provide a clean environment. Therefore, at the time of the invention, it would have been obvious to one having ordinary skill in the art to modify the process of Delamarche et al. by placing the article

"in reduced pressure atmosphere" in order to provide a clean environment to reduce contamination.

Regarding claim 4, Delamarche et al. further teach "wherein the second functional group of the second self-assembled monolayer-forming molecular species is non-polar (Delamarche et al. use the same species as applicant, PTMP).

Regarding claim 5, Delamarche et al. are silent in regards to the atmosphere of the stamping process. Since no special conditions are mentioned, a normal air atmosphere is implied. One having ordinary skill in the art would recognize that a normal air atmosphere is used by Delamarche et al.

Regarding claim 6, Delamarche et al. further teach "wherein the article' surface is a metal surface (see figure 3 and first 4 lines of the second paragraph on page 3834) and the self-assembled monolayer-forming molecular species is selected from the group consisting of:

an omega-functionalized thiol having the general formula R'-A-R", wherein R' is --SH, A is --$(CHR)_n$-- where R is H or --CH_3, and n is an integer from 1 to 30, and R" is a polar group (see figure 1, ECT, and the first 4 lines of the second paragraph on page 3834),

a disulphide having the general formula R'"-A-S-S-A'-R", wherein R'" is a polar or a non-polar group, A and A' independently are --$(CHR)_2n$-- where R is H or --CH_3, and n is an integer from 1 to 30, and R" is a polar group, different from or the same as R'", and

a thioether having the general formula R'"-A-S-A"-R" or R'"-A-S-A'-S-A"-R", wherein R'" is a polar or a non-polar group, A, A', and A" independently are --$(CHR)_2n$-- where R is H or --CH_3, and n is an integer from 1 to 30, and R" is a polar group, being different from or the same as R'"."

Regarding claim 7, Delamarche et al. further teach "wherein the polar group R" is a functional group selected from the group consisting of --OH, --NCO, --NH_2, --COOH, --NO_2, --COH, --COCl, --PO_4^{2-}, --OSO_3^-, --SO_3^-, --$CONH_22$, --$(OCH_2CH_2)_{2n}OH$, --$(OCH_2CH_2)_{2n}OCH_3$, --PO_3H^-, --CN, --SH (see figure 1, ECT, and the first 4 lines of the second paragraph on page 3834), --CH_2I, --CH_2Cl, and --CH_2Br, wherein n is an integer from 1 to 100."

2. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Delamarche et al. and Fleming et al. as applied to claim 1 above, further in view of Geissler et al. (*Langmuir* **2002**, 18, 2374-2377) and Xia et al. (*Angew. Chem., Int. Ed.* **1998**, 37, 550-575).

Regarding claim 10, Delamarche et al. fail to specifically disclose that their method of forming a self-assembled monolayer is used to manufacture an electronic device. However, Delamarche et al. teach that their method is used to create "a patterned layer on the surface of" various substrates, including those common to microelectronics (first 4 lines of the second paragraph of page 3834), and refers to numerous publications that teach said methods. Xia et al. (the first citation of Delamarche et al.) and Geissler et al. (the third citation of Delamarche et al.) teach

using SAMs with microcontact printing to produce microelectronic devices and storage elements because it is simple, inexpensive, and flexible (see section 3, specifically the last paragraph of section 3.2 of Xia et al. and the first paragraph of Geissler et al.). Therefore, it would have been obvious to one having ordinary skill in the art to use the microstructure production method of Delamarche et al. to produce microelectronic devices, as taught by Geissler et al. and Xia et al., because it is simple, inexpensive and flexible.

Response to Arguments

3. Applicant's arguments filed 11/10/09 with respect to all the claims have been fully considered but are not persuasive.

4. Applicant's argument that the limitation that the molecular species spread evenly from the first portion of the article surface to a second portion of the article surface is not met is not persuasive. Applicant disagrees with the examiner's assertion that, essentially, the spreading is a natural phenomenon that will inherently occur when the stamp is pressed into the substrate. As support for this assertion, reference is made to "Transport Mechanisms of Alkanethiols during Microcontact Printing on Gold" Delamarche et al., J. Phys. Chem. B, 1998, 102, pp 3324-3334. (hereinafter "Transport").

In "Transport," Delamarche et al. set forth the numerous pathways by which SAM species will disperse on a substrate during a stamping process (Figure 2), including through spreading from the point of contact of the stamp with the substrate (paths 1, 2

and 3 in Figure 2; second full paragraph on page 3327). Delamarche et al. further show that achieving good pattern transfer is a balance between achieving a defect-free protection of the substrate and *limiting the spreading of the ink during contact* which causes the pattern to broaden (first full paragraph on page 3329; Figure 6).

Furthermore, "Transport" shows that in only ***3*** seconds of conformal contact, using a 0.2 mM solution, the pattern spread by 0.1 ± 0.05 μm (paragraph bridging pages 3329 and 3330). In short, it is an unavoidable fact that spreading will naturally occur in the stamping of SAMs on gold substrates. Clearly, then, Delamarche et al. show in "Transport" that spreading during contact of the stamp is an *inherent, unavoidable* process.

As a comparison, Delamarche et al. in the process used in the rejection uses a contact time of ***30*** seconds (see the description under Figure 3). Owing at least to the time scale being an entire order of magnitude larger, and the fact that spreading has been shown to occur naturally, one having ordinary skill in the art would certainly have expected the spreading to occur, and thus the examiner's position is confirmed.

Furthermore, the five points asserted by applicant in page 9 of the reply are thus shown to be false. "Spreading beyond the boundaries of the stamped surface" 1) is clearly a concept present in the art, as evidenced by "Transport," and 2) is clearly inherent in the stamping process, as shown in "Transport." The fact that the spreading is 3) contraindicated by the fact that the prior art desired precise boundaries or 4) is inefficient for normal use is moot since the spreading is unavoidable, as shown in "Transport." And finally, the assertion that 5) "the usefulness of allowing the spread

beyond the boundaries is important and desirable only in the context of applicant's disclosure" is false because "Transport" discloses such importance and desire in the paragraph bridging the columns on page 3331, where control of the spread of the ink during printing was both desired and useful to achieving a patterned substrate.

As a final note regarding claim 1, applicant is advised that even though it is not relied upon in the current rejection, "Transport" anticipates claim 1, and applicant should expect that an anticipation rejection based upon "Transport" could be made in future Office Actions.

5. Next, applicant presents arguments pertaining to claim 2. Essentially, applicant argues solely against Delamarche et al., even though the rejection is not based solely upon the teachings of Delamarche et al.

Examiner respectfully believes the Applicant has misinterpreted the rejection. It has been established that Delamarche et al. teach stamping a surface, as is claimed in claim 1 and the first portion of claim 2. The admitted deficiency of Delamarche et al. is that the second molecular species is not stamped; rather, the second molecular species is placed on the previously stamped substrate via immersion.

It is Examiner's position that one having ordinary skill in the art would have been motivated to replace the immersion step of Delamarche et al. with another stamping step because "one having ordinary skill in the art would recognize that applying the second SAM-forming species on top of the first SAM-forming species by forcibly using a stamp would result in the second SAM-forming species spreading over the first SAM

and then adhering to the surface of the article and forming a second SAM. One having ordinary skill in the art would also recognize that applying pressure while applying the second species would speed up the coating process. Further, since the first SAM-forming species is applied via a stamp in the process of Delamarche, one having ordinary skill in the art would have been motivated to apply the second SAM-forming species to the article via a stamping process in order to effectively apply and distribute the second SAM-forming species."

As evidence that one having ordinary skill in the art would have reason to use a stamp to transfer a material, reference is once again made to "Transport." In the paragraph bridging pages 3328 and 3329 of "Transport," Delamarche et al. show that using a flat, patternless, PDMS stamp to form SAMs on a surface results in complete monolayer formed on the substrate. See also Figure 5. Therefore, it is maintained that one having ordinary skill in the art would have been motivated to apply the second SAM-forming species to the article via a stamping process in order to effectively apply and distribute the second SAM-forming species, *and would have had more than a reasonable expectation of success in making the modification*.

Regarding the limitation that the species 'spread evenly over the first monolayer to a second portion of the article's surface,' Delamarche et al. show in figure 2 that when the first molecular species is adsorbed on the surface, attack by the second molecular species will not substantially cause the first molecular species to desorb. Therefore, when modifying the method of Delamarche et al. to use a stamping process for the second molecular species, the second molecular species will *naturally* spread

evenly over the first SAM formed so as to adsorb onto portions of the surface which do not contain any adsorbed molecules of the first molecular species.

6. Finally, regarding applicant's argument that Delamarche et al. teach directly away from the combination because Delamarche et al. immerse the structure in a solution instead of stamping, it has been held that to teach away, a reference must state that it "should not" or "cannot" be used in combinations with another teaching. *Para-Ordnance Manufacturing, Inc. v. SGS Importers International, Inc.*, 73 F.3d 1085, 1090 (Fed. Cir. 1995). Since there is nothing in Delamarche et al. which says that one should not or cannot use stamping instead of immersing, and there is motivation present to use stamping, it is deemed that Delamarche et al. do not teach away from the proposed modification.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSHUA D. ZIMMERMAN whose telephone number is (571)272-2749. The examiner can normally be reached on M-R 8:30A - 6:00P, Alternate Fridays 8:30A-5:00P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on 571-272-2258. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Joshua D Zimmerman
Examiner
Art Unit 2854

/J. D. Z./
Examiner, Art Unit 2854